

REMARKS/ARGUMENTS

A Request for Continuing Examination is filed concurrently herewith. The office action of December 21, 2004 has been carefully reviewed and these remarks are responsive thereto. Reconsideration and allowance of the instant application are respectfully requested. Claims 1-14, 18-23, 27-35 and 43-44 remain in this application. Claims 15-17 are presently canceled without prejudice or disclaimer and claims 24-26 and 36-42 were previously canceled without prejudice or disclaimer.

Claims 1, 4, 23, 27, 34 and 35 are presently amended.

Claims 1-4, 13, 14, 18, 27, 28 and 32-35 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. patent no. 6,055,330 to Eleftheriadis et al. ("Eleftheriadis"). Applicant respectfully traverses this rejection.

Independent claim 1 calls for a method of producing a depth map including, among other steps, identifying at least one object within a 2D image, allocating an identifying tag to the at least one object, allocating a depth tag to the at least one object, determining and defining an outline for the at least one object, and has been amended to recite the step of encoding the identifying tag, the depth tag and the outline, of the at least one object to produce a depth map.

The action alleges that Eleftheriadis shows all the elements of claim 1. In particular, the action points to col. 9, lines 17-28 to show a method of producing a depth map, col. 8, lines 52-61 and col. 17, lines 1-20 to the step of identifying, col. 10, lines 34-45 and line 65 to col. 11, line 23 and col. 18, lines 36-44 to show the step of allocating an identifying tag, col. 10, lines 13-26 and col. 17, lines 40-52 to show the step of allocating a depth tag, and col. 9, line 45 to col. 10, line 26 and col. 17, lines 40-52 to show the step of determining and defining.

Contrary to the action's assertion, applicant submits that Eleftheriadis neither teaches nor suggests a method of producing a depth map including the steps recited in amended claim 1. Applicant submits that Eleftheriadis does not describe encoding the identifying tag, the depth tag and the outline, of the at least one object to produce a depth map as recited in amended claim 1. Rather, Eleftheriadis merely describes a technique for compressing a video signal. In order to compress the video signal, Eleftheriadis needs to know the location of objects within the video image and in order to locate such objects Eleftheriadis requires a depth map. Significantly,

Eleftheriadis automatically obtains depth maps from a special "depth camera" 100 that produces a video signal 101 (a conventional 2D video signal) and a depth signal (i.e. depth map). At col. 9, lines 18-20 Eleftheriadis discloses that such a depth camera automatically generates a depth map: "[t]he array of depth values, or depth map, generated by camera 100 and fed into a 16-bit wide buffer 512 via bus 511." Eleftheriadis discloses nothing more than the camera 100 automatically generating the depth map.

Eleftheriadis discloses a method in which a depth map is used rather than a series of steps for producing a depth map. The portions of Eleftheriadis relied on in the action to allegedly show the steps of producing a depth map merely relate to the utilization of depth information and not to producing a depth map as recited in claim 1. The depth map produced by a depth sensing camera as described in Eleftheriadis is not a suitable means of associating depth with objects in the present invention. The restrictions on range and accuracy as well as the inability to emphasize depth relationships between objects make such depth maps inappropriate.

Furthermore, the distinction between the depth maps received by the Eleftheriadis apparatus and the depth maps produced according to claim 1 is due to the differences in their respective applications. The Eleftheriadis apparatus is used for image compression in which geometrically accurate depth information is required.

Eleftheriadis describes an apparatus for "receiving depth information." According to Eleftheriadis the depth information represents the physical distances of the object to a depth sensing camera. Such depth sensing cameras measure the physical distance from the camera by calculating the amount of time required for a pulse of light to reflect off the object. There is no other description in Eleftheriadis of providing depth information, and Eleftheriadis only describes receiving depth information and using the depth maps from the depth sensing camera to identify individual objects.

The depth map produced according to the method of claim 1 is not received by a depth map camera, but rather is the result of the extraction of information from the image data. The method of claim 1 relates to identifying object information in the source image. After an object has been identified, depth information is associated with the object.

In paragraphs 5 and 6, the action asserts that Eleftheriadis "does indeed determine and assign depth tags for the at least one object in each respective frame ..." Applicant submits that the Eleftheriadis apparatus does not "determine" the depth of an object. Rather, the depth map captured by the depth sensing camera determines the extent of the objects. The depth map is used to generate the objects themselves, whereas according to claim 1 the object is identified within a 2D image, an identifying tag and a depth tag are allocated to the object, an outline that defines the object is determined, and then depth maps are produced for the object.

In light of the foregoing, applicant submits that claim 1 is patentably distinguishable from Eleftheriadis. Claims 2-4, 13, 14, and 18, which ultimately depend from claim 1, are patentably distinct from Eleftheriadis for the same reasons as claim 1, and further in view of the novel and non-obvious features described therein.

The action asserts that Eleftheriadis discloses that the outline (contour, border, and boundary) is defined by a series of coordinates, curves, and/or geometric shapes at col. 15, lines 46-68; col. 6, lines 20-33; and col. 18, lines 56-65. However, as discussed with regard to claim 1, Eleftheriadis does not disclose a method of producing a depth map, but rather discloses a system that receives a depth map from a depth sensing camera. Eleftheriadis describes an apparatus in which objects are identified within the depth image, but does not discuss how objects can be identified within the 2D video image as recited in claim 1. The depth information associated with objects in Eleftheriadis is directly derived from the depth sensing camera. A depth tag is not allocated to an object, as recited in claim 1; the depth value is calculated from the histogram of the object's depth values (column 17, lines 42-52).

Claim 4 has been amended to more clearly recite the invention, reciting that the step of identifying of the at least one object occurs prior to the determining and defining step and includes the step of comparing the 2D image against a library of images having predetermined depth maps and selecting a depth map associated with a library image which produces the best match with the 2D image.

The action contends that Eleftheriadis discloses comparing the 2D image with a library of generic scenes as recited claim 4. However, at col. 7, lines 58-62, Eleftheriadis discloses that the past and present video data is used "to generate motion vectors". The generation of motion

vectors does not represent the comparison of 2D images having predetermined depth maps and selecting a depth map from a library image that produces the best match with said 2D image recited in amended claim 4.

The action alleges that Eleftheriadis discloses tracking at least one object as recited in claim 18 pointing to a VOP (Video Object Plane) at col. 18, lines 45-55. At col. 15, lines 48-53 Eleftheriadis defines VO and VOP as follows: "[t]he basic structure of MPEG-4 is similar to ITU H.263, except for the notion of a Video Object (VO) and a Video Object Plane (VOP). As illustrated in FIG 14, VOs are independent objects 1410, 1420, 1430 that may exist in a scene while VOPs are two dimensional images of arbitrary shape 1411, 1421, 1431." Col. 18, lines 45-55 clearly states that VOPs and not objects are tracked from one frame to another. Eleftheriadis is wholly devoid of any teaching or suggestion of determining and assigning depth tags as recited in claim 18 in the portion cited in the action or otherwise.

Independent claim 27 has been amended to recite the step of producing the depth map by encoding the depth tag and the outline of the object. Applicant submits that claim 27 is patentable over the art of record for at least substantially the same reasons set forth with regard to claim 1 to the extent that they recite similar features.

Claims 28 and 32-35, which ultimately depend from claim 27, are patentably distinct from Eleftheriadis for the same reasons as claim 27 and further in view of the novel and non-obvious features recited therein.

Claims 34 and 35 have been amended to recite a "depth function" rather than a depth type to better clarify the invention.

Claims 5, 19 and 21-23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eleftheriadis as applied to claims 1 and 2 above. Claims 6-10 and 29-31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eleftheriadis as applied to claims 1, 2 and 28 above and further in view of U.S. patent no. 6,029,173 to Meek et al. ("Meek"). Claims 11 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eleftheriadis as applied to claim 1 above and further in view of U.S. patent no. 5,793,900 to Nourbakhsh et al. ("Nourbakhsh"). Claims 15-17, 20, 43 and 44 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eleftheriadis as applied to claims 1, 19 and 27 above and further in view of

U.S. patent no. 4,925,294 to Geshwind et al. ("Geshwind"). Claims 15-17 have been canceled without prejudice. Applicant respectfully traverses these rejections with regard to claims.

With regard to the rejection of claim 5, Applicant submits that the "boundary value" referred to by Eleftheriadis in column 9, line 45-50 does not refer to the pixel boundary in an image surrounding an object (i.e. an outline) but refers to a boundary in the thresholded histogram of the depth map. The boundary referred to by Eleftheriadis therefore is not an outline, but rather a single boundary value which designates the transition from one set of depth values in the histogram to another.

The outline recited in claim 5 relates not to a single value, but to an outline of an object within a 2D image determined by tracing the object pixel by pixel. Therefore, Applicant submits that claim 5 is patentable for the foregoing reasons set forth with regard to claim 1, and for at least this additional reason.

Claims 19, 21 and 22, are dependent on claim 1, which recites a method for producing a depth map by identifying objects in the image, allocating a depth tag to the at least one object and producing the depth map. Applicant submits that it would not have been obvious to one skilled in the art at the time of the invention to add a texture map to the allocated object to produce a textured depth map with respect to a method of converting 2D images into stereoscopic images. Neither Eleftheriadis nor Geshwind teaches adding texture to a depth map.

With regard to claim 23, this claim has been amended to recite the further step of producing grayscale that are at a lower resolution than each 2D image. Applicant submits that Eleftheriadis does not teach or suggest this feature, and therefore claim 23 is patentable for at least this additional reason.

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CONCLUSION

All rejections having been addressed, applicant respectfully submits that the instant application is in condition for allowance, and respectfully solicits prompt notification of the same.


If any additional fees are required or if an overpayment is made, the Commissioner is authorized to debit or credit our Deposit Account No. 19-0733, accordingly.

Respectfully submitted,

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